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PLANETARY PHENOMENA FOR NOVEMBER AND
DECEMBER, 1920

By MALCOLM McNEILL

PHASES OF THE MOON, PACIFIC TIME

Last Quarter....Nov. 2, 11 ^h 35 ^m P.M.	Last Quarter.....Dec. 2, 8 ^h 29 ^m A.M.
New Moon..... " 10, 8 5 A.M.	New Moon..... " 10, 2 4 A.M.
First Quarter... " 18, 12 13 P.M.	First Quarter.... " 18, 6 40 A.M.
Full Moon..... " 25, 5 42 P.M.	Full Moon..... " 25, 4 38 A.M.
	Last Quarter..... " 31, 8 35 P.M.

The fourth and last eclipse of the year is a *partial eclipse of the Sun* on November 10th. The maximum obscuration is about three-fourths of the Sun's diameter. The region of visibility is eastern North America, the North Atlantic, and western Europe and Africa. The eclipse will be ended before sunrise on the western coast of the United States, but may be seen as a small partial eclipse in the early morning thruout the central and eastern parts of the country.

The Sun is at the winter solstice December 21st, 7^h17^m P. M., Pacific Time.

The Earth is in perihelion December 31st, 9 P. M., Pacific Time.

Mercury is an evening star on November 1st, having passed greatest east elongation on October 25th, but sets less than an hour after sunset so that the condition for visibility is not good. It reaches inferior conjunction and becomes a morning star on November 15th. It then moves out toward greatest west elongation reaching that point on December 3rd. It then rises more than an hour and one half before sunrise, and the interval remains more than an hour until after the middle of the month. Therefore during the last few days in November and the first half of December we have the best opportunity of the year for a morning view of *Mercury*.

Venus is an evening star setting about an hour and a half after sunset on November 1st; this interval increases quite rapidly so that by the end of December it is nearly three and one-half hours, and the planet has nearly arrived at its greatest east elongation, being 45° east of the Sun on December 31st. As *Venus* by this time is getting around to the part of its orbit nearer the Earth it will be markedly brighter than it was during the early summer, altho not nearly as bright as it will be in March after it has passed greatest east elongation.

Mars is still to be seen in the southwestern sky in the evening, setting at about half after eight, local mean time, with only a few

minutes variation thru November and December. Both Sun and planet are moving eastward among the stars, the Sun gaining on the planet about 17° . This by itself would cause the planet to set earlier and earlier, but *Mars* moves 10° more northward than the Sun and this causes a later setting of the planet. These two conflicting elements combined with a rapid shift in the equation of time cause the planet to set at almost the same clock time thruout the two months. The actual distance of *Mars* from the Earth is still increasing rapidly, but at a slightly diminished rate. In consequence the planet is growing fainter, but even at the end of the year it will be nearly as bright as a standard first magnitude star.

Jupiter is a morning star drawing farther away from the *Sun* and rising earlier; on November 1st it rises at a little before 2 A. M. and on December 31st at about 10:30 P. M. It is still in the constellation *Leo*, and moves eastward 5° and southward 2° during the two months.

Saturn is east and south of *Jupiter*, rising at about half after two A. M. on November 1st and shortly before 11 P. M. on December 31st. It is also in *Leo* and moves 3° eastward and 1° southward during the period. *Jupiter* is therefore overtaking it and the bodies will come to conjunction with each other in 1921. On December 31st their distance apart is about 6° . The relative positions of the two planets will shift in quite an interesting way during 1921. Early in November the Earth passes thru the plane of *Saturn's* rings. For several years the southern face of the rings has been turned toward the Earth, now we see the northern face, but as we are nearly in the plane of the rings they look in the telescope like a mere straight line.

Uranus is in the southwestern sky in the evening, setting a little before 1 A. M. on November 1st, and at about 9 P. M. on December 31st, but on account of its faintness it is not visible to the naked eye for two hours or more before the time of setting. It is still in the constellation *Aquarius* and moves westward until November 11th and then eastward during the rest of the two months on a line a little north of its westward motion. It is still in the neighborhood of the fifth magnitude star σ *Aquarii* and is now approaching it from the west. At the end of December it will be about $1^\circ 30'$ west of the star.

Neptune rises late in the evening. It is near the dividing line between *Cancer* and *Leo*.